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About Some Economic Applications of Cohort Analysis

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Abstract. Nowadays, there is the problem of evaluating the return on advertising costs for industries with a delayed conversion. Cohort analysis is a series of studies which are conducted at certain time intervals. Using cohort analysis we can better assess the effectiveness of advertising channels for industries with a delayed conversion. Cohort analysis can be used to analyze following items: efficiency in the context of "traffic sources", usefulness of changes on the web site; assessment of effectiveness of marketing campaigns; assessment of impact of seasonality on the behavior of the user; the decision-making period. The article presents an overview of tools we can use to collect data for analysis. The article also describes the method of selection and the variants of the cohorts to construct the analysis. For demonstration of the proposed method and calculation variant, there is considered the practical example of building a cohort analysis. Using these method and the example of calculating, the companies with delayed conversion can analyze the effectiveness of Internet advertising for different advertising channels.

INTRODUCTION

Every year the number of sites and online stores is growing rapidly. Internet sites offer the various types of goods and services, and there is very high competition in this field. Therefore, one of the important tasks here is the analysis of the websites audience in order to attract clients and encourage them to a certain actions.

The data on the audience of sites represents big amount of unstructured information about the users, who have just started to use the resource, regular customers, and the clients, who visit the website daily, monthly. Monitoring and analysis of this heterogeneous information is extremely difficult task. There are many modern methods for processing and analyzing of information, which can be used in economics and business (for example, [1, 2]).

This paper is devoted to the method of cohort analysis. The objectives of the research are the following: to consider the construction of cohorts, to analyze the effectiveness of cohort analysis in online advertising, to consider examples of the use of cohort analysis.

THEORETICAL BASEMENT

At the moment, the cohort analysis is rarely used in online advertising analysis. Most often this method is used by big marketing agencies such as Harris Interactive Inc. and The Gallup Organization, which are specialized on public opinion research.

Cohort analysis is a very effective tool for product and marketing analytics. It differs from the mass analysis, and allows comparing a group, combined by a single trait. The idea of cohort analysis is to divide users into groups according to certain criteria, and to track the behavior of these groups in time [3, 4].

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Usually, a group of people (cohort) are identified on the basis of the time interval (week, month), when users come to the site or made some conversion action. By selecting such a group of people (cohort), we can follow them over time and we can measure key metrics for each cohort [5].

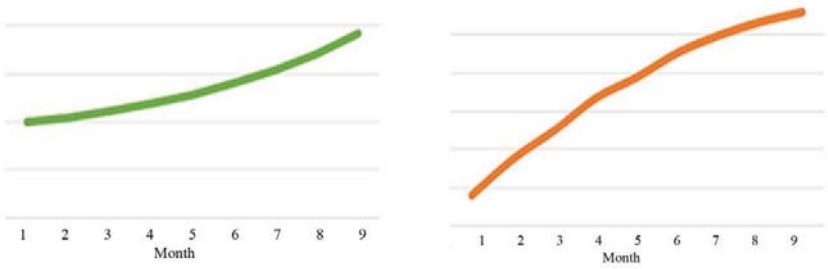
Also we can identify the audience by type of traffic source, for example, an Audience attracted from social networks, with Yandex Direct advertising or Google Adwords or users who read the newsletter.

The cohort can be characterized by several indicators:

- Date. This may be the first visit, the date of registration on the website or completing a conversion action.
- Time. A certain period of time for which there is already available actual data (4 weeks, 3 months, six months, etc.).
- Quantity. It is defined in a particular time period, for example, the number of registered users in April.
- Metric. We can calculate registration, orders, or purchases, average check and revenues, the number of pages that viewed by a single user, the number of visitors to the site, etc.

We can conduct cohort analysis using the tool of Google Analytics and, for example, manually in Excel.

Let's follow the audience and profit for several months, for example, on data of one company.

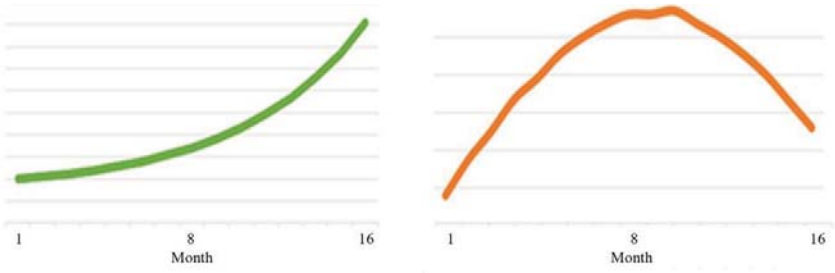


a) b)

FIGURE 1. Audience (a) and profit (b) for the first 9 months.

Following the selected metrics after the first 9 months, we can see that the audience grows, so the company's profit also goes up (Fig. 1).

Below are the same graphs, but for 16 months (Fig. 2). On these charts we can see the first signs of a failed product changes, but only after 12 months.



a) b)

FIGURE 2. Audience (a) and profit (b) for the first 16 months..

The fact is that the metric of growth is affected by two components: product and promotion (site changes, marketing campaigns). Watching the metrics of growth, it is impossible to separate these two factors. For this reason, the metric of growth is absolutely not suitable for product analytics.

With a properly constructed analytics, we could see the unfortunate impact of product updates in the first weeks / months [6].

It is also possible to estimate the number of repeat orders. The percentage of reorders indicates the state of the business. If loyal customers generate 30% of revenue or more is a good indicator. In addition, cohort show whether the company has loyal customers and how many are they.

If the analysis shows that repeated purchases becomes smaller, it is necessary to pay attention to the quality of service, range of products or to carry out marketing promotions for returning customers (Fig. 3) [7].

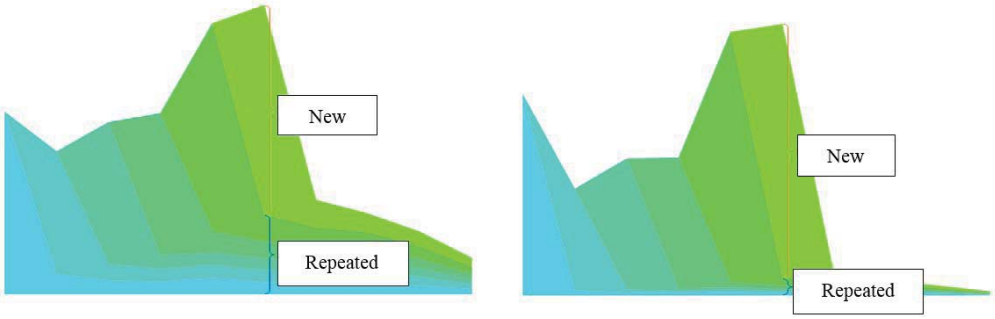


FIGURE 3. Comparison of the number of new and repeated orders from the website.

PRACTICAL APPLICATION

Here are a few examples of the practical use of cohort analysis in the Internet marketing.

Example 1.

We divided the audience into cohorts by age. One group had limits of 20 to 29 years, the second - from 30 to 39. Cohort analysis showed that the audience of the age of 30-39 years unwillingly made the first purchase, but if they did this purchase, then they in anyway came back for the second. At the same time, the audience of the age of 20-29 years made easy the first purchase, but they didn't come back for the repeat purchase. The results showed that the audience 30-39 years brought more money six months later. Therefore, further efforts should be concentrated in this segment.

Using cohort analysis, we were able to obtain this data and choose the best marketing strategy for further development.

Example 2.

In the beginning of 2017, the Shoe store addressed with the problem of the declining of purchases and a large number of items from the old collection on the stock. For a Shoe store from 30.01.2017 to 13.02.2017 there was launched an advertising campaign with information on the liquidation of an old collection with 20% discount.

For assessment of effectiveness of this company we took a return on the money invested value (ROI), as a criterion of effectiveness. The cohorts will consist of users, the first visit of which was in a particular week, for example, the first cohort is taken for users the first visit of which was from 09.01.2017 to 15.01.2017.

In Figure 4 one can see that before the launch of promotional campaign, the payback of the first cohort occurred at week 4, and the payback of the second and third cohorts did not occur. After the launch of the promotional campaign in the fourth and fifth cohort, the payback took place in the second week. In the sixth cohort, the payoff also occurred for the second week, although the advertising company was already disabled.

With the help of a cohort analysis, we were able to determine the return on the invested money in the promotional campaign and also found out that even after the end of the advertising campaign ROI was more than 100%.

		Week of purchase							
		2017-01-09	2017-01-16	2017-01-23	2017-01-30	2017-02-06	2017-02-13	2017-02-20	2017-02-27
Cohort	1	58%	74%	87%	97%	102%	108%	122%	135%
	2		43%	57%	61%	82%	88%	92%	94%
	3			37%	54%	60%	66%	74%	87%
	4				66%	103%	119%	129%	154%
	5					89%	128%	152%	171%
	6						69%	108%	115%
	7							34%	48%
	8								74%

FIGURE 4. Summary data.

CONCLUSION

The study showed that with the help of cohort analysis it is possible to solve a wide range of issues, namely:

- Segment the audience into homogeneous groups in order to work with each of them separately. This is more efficient way than to achieve an acceptable average value for the entire audience.
- Assess the quality of each of the traffic sources.
- Compile a portrait of the "perfect buyer".

Cohort analysis can provide data to make business decisions, because one can determine the most effective channel of advertising; identify the best days of the advertising campaigns running and the best seasonal days to launch the marketing campaigns. In addition, it is possible to determine the "cycle of life" and "events" of each client, calculate the number of purchases and earnings for a specific size of cohort, analyze and predict the development of the particular product.

Thus, this simple tool can be useful in the analysis and management of companies' development.

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